638 - Water and Sediment Control Basin (No.)

Definition

An earth embankment or a combination ridge and channel generally constructed across the slope and minor water courses to form a sediment trap and a water detention basin.

Scope

This standard applies to the planning, designing, and constructing water and sediment control basins. It does not apply to Diversions (362), Grade Stabilization Structures (410), or Sediment Basins (350).

Purpose

To improve farmability of sloping land, reduce water course and gully erosion, trap sediment, reduce and manage onsite and downstream runoff, and to improve downstream water quality.

Conditions Where Practice Applies

This practice applies to sites where:

1. The topography is generally irregular.
2. Water course and gully erosion are a problem.
3. Sheet and rill erosion are controlled by other conservation practices.
4. Runoff and sediment damage land and improvements.
5. Soil and site conditions are suitable.
6. Adequate outlets are available or can be provided.

Planning Considerations for Water Quantity and Quality

This practice when used in erosion control systems will reduce slope length and the amount of surface runoff which passes over the area downstream from the structure. Structures with underground outlets will slow and retain runoff thus increasing infiltration and percolation to the ground water recharge. Following are additional planning considerations:

1. This practice traps water, sediment, and sediment - attached particles from runoff.

2. In silty soils, 90 percent or more of phosphorus and chemicals transported may be trapped.

3. Dissolved substances such an nitrates will be removed from the runoff but may be added to the groundwater or saved for crop or other plant use.

4. Areas disturbed by construction of water and sediment control basins will need to have a liberal application of fertilizer and lime, be deep plowed, and be planted to a nurse crop to improve soil tilth and crop production.

Design Criteria

Water and sediment control basins can be part of the treatment needed to protect the soil resource base. In addition, other practices such as terraces, contouring, a conservation cropping system, conservation tillage, and crop residue management shall also be used to control erosion.

Water and sediment control basins shall not be used in place of terraces. When a ridge and channel extend beyond the detention basin or level embankment, terraces shall be designed. The resource management system must reduce soil loss in the interval above and below the basin to prevent excessive maintenance and operation problems.

Spacing

Water and sediment control basins shall generally be spaced at terrace intervals. The grade of water course between basins shall be considered, and the spacing shall be set to prevent water course or gully erosion. The drainage of each basin shall be limited so duration of flooding, infiltration, or seepage does not damage crops or create other problems.

The system of basins and row arrangements shall be parallel where possible and spaced to accommodate farm machinery widths. Where possible rows must be on the contour and must permit operation of modern farm machinery. Water and sediment control basins used in conjunction with planned or existing terrace or diversion systems should be spaced to be compatible with the system and be farmable. Consideration shall be given to embankment slope lengths, top width, and inlet location when determining spacing and farmability.

Alignment

The embankment orientation and row direction shall be approximately perpendicular to the land slope to permit contouring as near as possible. The arrangement should permit farmability without excessive short point rows or sharp curves. Field boundaries and row length should also be considered when determining basin location and row direction.

Cross Section

Embankment slopes shall not be steeper than 2 horizontal to 1 vertical. The effective top width and height shall be at least as wide as shown in the following.

Fill Height		Minimum Top Width	
Ft.	(M)	Ft.	(M)
0.0 - 5.0	(0.0 - 1.5)	3.0	(0.91)
5.0 -10.0	(1.5 - 3.1)	6.0	(1.83)
10.0 -15.0	(3.1 - 4.6)	8.0	(2.44)

The constructed height of the embankment shall be at least 5 percent greater than the designed height to allow for sediment. The maximum settled height shall be (4.6M) 15 ft. measured from the natural ground at the centerline of the embankment. Slopes may be vegetated or may be flattened to permit cropping. Slopes planned to be farmable should be 4:1 or flatter. Construction will be done in a manner to leave the area as productive as possible. A borrow source will be planned for material to build the major embankment. The surface soil will be salvaged from the borrow source and basin area and redistributed over the cut area and embankment when construction is completed.

Capacity

The basin shall be large enough to contain the runoff from a 10-year, 24-hour frequency storm without overtopping. The capacity of basins designed to provide flood protection or to function with other structures may be larger and shall be adequate to contain the runoff from a storm of a frequency consistent with the potential hazard. The basin also shall have the capacity to store the anticipated 10-year sediment accumulation, unless provisions are made for periodic sediment removal from the basin to maintain the design capacity.

End Closures

The basins shall have the ends closed to the elevation needed for the design capacity. A maximum of (0.31m) 1 ft. of freeboard may be added to the design height to provide for an emergency spillway around one or both ends of the basin. The emergency spillway must not contribute runoff to a lower basin in series that does not have an emergency spillway.

Outlets

Water and sediment control basins shall have underground outlets or soil infiltration outlets that meet the requirements of FOTG Standard, Terraces - 600 and Underground Outlets - 620.

Vegetation

It is recommended that all cut areas be limed, fertilized, and deep plowed, ripped, or chiseled immediately after construction is completed. All disturbed areas that are not to be farmed shall be established to close growing perennial cover as soon as practicable after construction. If construction is completed outside of the normal seeding or sodding period and protection is needed until a planting can be made, either short term (temporary) cover or mulch will be applied, planting for perennial and short term cover will be made in accordance with FOTG Standard 342 - Critical Area Planting and Mulch will be applied according to Mulching - 484. The sod shall be maintained and trees and brush controlled by chemical or mechanical means.

OPERATION AND MAINTENANCE

An operation and maintenance job sheet or plan will be provided for each structure or job. The plan will be provided for the design capacity embankment, pipe outlet structure, and vegetative cover.

Maintenance should include inspection of inlets for clogging and embankment failure after each large storm. Failures should be corrected as soon as possible to prevent major damages.

The sediment and design capacity shall be maintained by cleaning the basin or by raising the embankment height. Excavated material spread on the cropland shall be placed in such a manner as to maintain fertility and enhance topography. Fill material for increasing the embankment height shall be obtained in a manner that enhances topography and maintains productivity of the cropland. The vegetation shall be maintained to prevent sheet and rill erosion or gullying of the embankment. Trees and woody cover generally create problems on embankment and should be controlled.

PLANS AND SPECIFICATIONS

Plans and specifications for installing water and sediment control basins shall be in keeping with this standard and shall describe the requirements for installing the practice to achieve its intended purpose.

REFERENCES

Engineering Field Manual for Conservation Practices, Chapters 6, 8, and 10.
Engineering Technical Note ENG AL-10.

CONSTRUCTION SPECIFICATIONS FOR WATER AND SEDIMENT CONTROL BASIN

Scope. This item shall include the clearing, excavation, shaping, and other appurtenances required for the construction of the water and sediment control basin.

Construction operations shall be carried out in such a manner that erosion, air, water, and noise pollution will be minimized and held within legal limits as established by State regulations.

Clearing. The area to be occupied by the water and sediment control basin shall be cleared of all trees, stumps, brush, and debris. All ditches, rills, or gullies to be crossed shall either be filled before construction begins or as part of the construction. All obstructions that will interfere with the successful operation of the basin will be removed.

All residue from the above operation shall be disposed of by burning, burying at approved locations, or otherwise removing from the site and stacking in neat piles. All burning shall conform to Alabama laws.

Surface Soils. The surface layer of soils excavated from the water and sediment control basin should be saved and spread on the embankment and cut areas to facilitate establishment of vegetation and/or crop production.

Alignment, Grade, and Spacing. The basin construction will be to lines, dimensions, grades, and spacing as staked on the site to the extent that skillful operation of the equipment will permit. When required, cut, and fill will be made along the basin channel for the purpose of improving alignment farmability and facilitating better maintenance. Construction will be performed in a manner to leave the area as productive as possible. Borrow sources will be planned and used for material to build major embankments. Surface soils will be salvaged and redistributed over the embankment and borrow area after construction is completed.

Provisions must be made where underground conduits are located under basin embankments to prevent piping. Mechanical compaction, water packing, trench sidewall sloping, and installation and backfill of conduit trenches far enough in advance to allow adequate settlement are methods that can be used. The materials used for the inlet and conduit will be suitable for the purpose intended (See Practice Standard 606). Basin ridges and embankments constructed across gullies and depressions will be compacted by machinery travel, sheepfoot rollers, or other means sufficient to insure proper functioning of the basin. The surface of the finished basin shall be reasonably smooth and accommodate modern farm and maintenance equipment.

Cross Section. The side slopes and top of the basin shall be smooth and uniform to facilitate use and maintenance. The basin and other structures shall be built to allow for the efficient operation of farming and maintenance equipment.

Operation and Maintenance. The owner or landuser will be given a plan for operation and maintenance of the water and sediment control basin. The plan will include the requirements to maintain design capacity, embankment shape, pipe outlet structure, vegetative cover and inspection needs. The owner or operator will be expected to maintain the basin in good operating condition at all times. Repairs, fertilization, and mowing will be performed in a timely manner.

Vegetation. Vegetation treatment shall be applied as specified or as shown on the plans. Vegetation shall be applied as critical area planting and will include seedbed preparation, seeding, liming, fertilizing, and, where required, mulching.